AD-A165 413 SOFTWARE DEVELOPMENT AND WEAPONS SYSTEM TEST SUPPORT 1/1
(U) SCIENCE APPLICATIONS INC HUNTSVILLE AL 31 JAN 84
SAI-84/5000-HU DAAH01-84-P-0339

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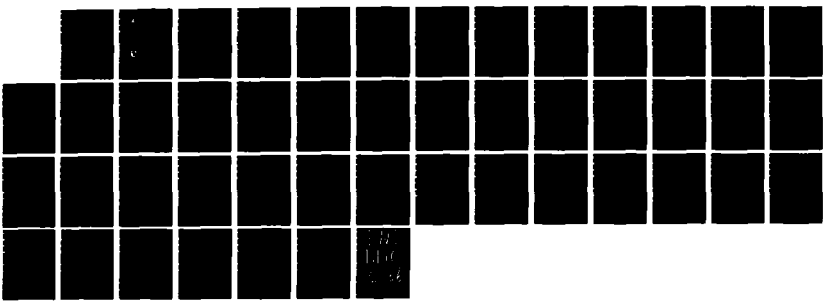

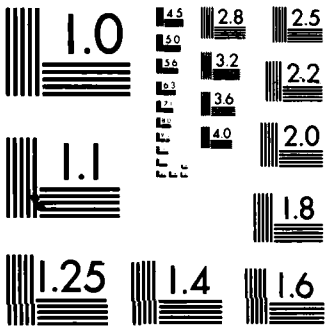

MICROCOPY RESOLUTION TEST CHART

SAI-84/5000-@ HU

FINAL REPORT

SOFTWARE DEVELOPMENT AND WEAPONS SYSTEM TEST SUPPORT

Prepared by:

Laser and Optical Test Group
Test and Evaluation Directorate
US Army Missile Laboratory
US Army Missile Command
and
Science Applications, Inc.
Huntsville, Alabama
under
Purchase Order DAAH01-84-P-0339

31 January 1984

U.S. ARMY MISSILE COMMAND
Redstone Arsenal, Alabama 35898

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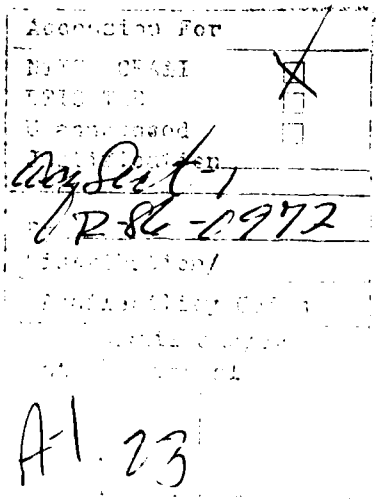
PREFACE

The activities and tasks described in this report are the results of work performed by Science Applications, Inc. under Purchase Order DAAH01-84-P-0339 for the US Army Missile Command, Redstone Arsenal, Alabama.



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LIST OF ILLUSTRATIONS

INTRODUCTION

The task documented herein was performed under Purchase Order DAAH01-84-P-0339 in support of the HELLFIRE and TOW programs. This support included software modifications and development, system maintenance, and weapons system test support in the form of data reduction and processing.

A. MISSILE POSITION-IN-SPACE SOFTWARE SUPPORT

The Laser and Optical Test Group was tasked with determining the potential of using digitized video image analysis to compute the spatial position of missiles in flight. It was felt that the video data could then be combined with range position data recorded from the laser doppler velocimeter to calculate position-in-space of a missile as it travels along its flight path.

The video data was recorded using a silicon vidicon camera and a Sony video cassette recorder. They are typically the devices employed by the group in their video data collection activities during range testing.

1. Concept Assumptions

The assumption was that if the camera were aligned in the vertical and horizontal planes of the line-of-sight from the missile launcher to the center of the target, deviations to the left or right and up or down could be readily determined in terms of digitized pixel positions. Down range position could then be acquired by using the laser doppler data.

2. Processing Concepts

SAI was tasked to determine the digitized horizontal and vertical (x,y) pixel position of the missile as it flew from the missile launcher to the target. This was accomplished by digitizing the missile beacon or exhaust plume and calculating the weighted x,y centroid of this source.

As a control measure for determining if the camera was shifting or vibrating during missile flight, a reference light source was included in the video scene. The x,y weighted centroid of this reference source was computed prior to missile firing. Its centroid was then computed in each frame of digitized data to detect any change in its position. If a change in the centroid of the reference source did occur, then naturally

provisions would have to be made for corresponding adjustments in the computed missile position. These adjustments were made in the processing phase associated with combining digitized video data with the laser doppler data and were accomplished by Lockheed personnel.

3. Video Data Processing

Ten second segments of the analog video tape were stored to the Ampex video disk and analyzed using software program MTAN2. MTAN2 requires manual user interaction on the first frame of a video segment to be processed to define the location of the reference light source and the initial position of the in-flight missile. On each frame thereafter the program tracks the moving missile automatically with no user intervention required.

An actual sample of the software digitizing output file is shown in Table 1 with 556 records encompassing a missile flight time of approximately 20.8 seconds of data. The first line of the data file is descriptive heading information followed by a blank line. After the blank line the data follows.

The following is a column-by-column description of the data contained in the output records.

Data Column 1	Sequential line number for each data record contained in the output file.
Data Column 2	The sequential frame number of the video segment being processed. As shown by the data sample, it begins by counting the first frame as frame 0.
Data Columns 3 - 7	These columns contain the IRIG time of the frame being processed. The time is expressed as days, hours, minutes, seconds, and tens of milliseconds.

*Data Column 8 - Track XX	The video disk track number of the current frame as it was processed.
Data Column 9 - X(P):XX	The computed X pixel position of the weighted centroid of the digitized missile beacon or exhaust plume.
Data Column 10 - Y(P):XX	The corresponding data for Y as in Data Column 9.
Data Column 11 - XC:XX	The computed X position of the weighted centroid of the digitized reference light source in each video frame processed.
Data Column 12 - YC:XX	The corresponding data for Y as in Data Column 11.
*Data Column 8 - No Shot	This entry is placed in the data record in those cases where the intensity of the missile beacon or exhaust plume is too low in intensity to be detected by the processing software.

SAI processed three of these test runs. These runs were stored on 9 track, 800 BPI magnetic tape and delivered to Lockheed personnel for combining with the laser doppler velocimeter data for further processing.

THE FOLLOWING PAGES

TABLE 1. Software Digitizing Output File

```
EFV25M T=00003 IS ON CR00054 USING 00146 BLKS R=2000.

0001   1            **** MTHNZ DATA REDUCTION -- EFV25M
0002
0003       0        209 18:59:53:08  TRACK  40  XCP):  79 YCP):  364 XC:  19  YC:  1..  ...
0004       1        209 18:59:53:11  TRACK  41  XCP):  85 YCP):  350 XC:  156 YC:  249
0005       2        209 18:59:53:14  TRACK  42  XCP):  104 YCP):  350 XC:  181 YC:  249
0006       0        209 18:59:53:93  TRACK  43  XCP):  181 YCP):  359 XC:  199 YC:  250
0007       1        209 18:59:53:96  TRACK  44      NO SPOT
0008       2        209 18:59:53:99  TRACK  45  XCP):  184 YCP):  359 XC:  199 YC:  250
0009       3        209 18:59:54:02  TRACK  46  XCP):  185 YCP):  336 XC:  199 YC:  249
0010       0        209 18:59:54:06  TRACK  47  XCP):  275 YCP):  338 XC:  194 YC:  248
0011       1        209 18:59:54:09  TRACK  48  XCP):  283 YCP):  335 XC:  192 YC:  249
0012       2        209 18:59:54:12  TRACK  49  XCP):  297 YCP):  329 XC:  194 YC:  249
0013       0        209 18:59:54:16  TRACK  50  XCP):  305 YCP):  310 XC:  195 YC:  246
0014       1        209 18:59:54:19  TRACK  51  XCP):  313 YCP):  298 XC:  193 YC:  248
0015       2        209 18:59:54:22  TRACK  52  XCP):  313 YCP):  288 XC:  194 YC:  248
0016       0        209 18:59:54:26  TRACK  53  XCP):  314 YCP):  281 XC:  197 YC:  249
0017       1        209 18:59:54:29  TRACK  54  XCP):  314 YCP):  258 XC:  197 YC:  249
0018       0        209 18:59:54:33  TRACK  55  XCP):  307 YCP):  232 XC:  197 YC:  249
0019       1        209 18:59:54:36  TRACK  56  XCP):  308 YCP):  227 XC:  197 YC:  248
0020       0        209 18:59:54:73  TRACK  57  XCP):  292 YCP):  227 XC:  197 YC:  250
0021       1        209 18:59:54:76  TRACK  58  XCP):  281 YCP):  234 XC:  197 YC:  250
0022       2        209 18:59:54:79  TRACK  59  XCP):  281 YCP):  242 XC:  197 YC:  251
0023       3        209 18:59:54:83  TRACK  60      NO SPOT
0024       0        209 18:59:54:53  TRACK  61  XCP):  276 YCP):  270 XC:  200 YC:  253
0025       1        209 18:59:54:56  TRACK  62  XCP):  276 YCP):  278 XC:  200 YC:  253
0026       0        209 18:59:54:61  TRACK  63  XCP):  287 YCP):  292 XC:  200 YC:  253
0027       1        209 18:59:54:64  TRACK  64  XCP):  288 YCP):  301 XC:  200 YC:  252
0028       2        209 18:59:54:67  TRACK  65  XCP):  288 YCP):  315 XC:  200 YC:  252
0029       0        209 18:59:54:07  TRACK  66  XCP):  313 YCP):  305 XC:  197 YC:  255
0030       1        209 18:59:54:10  TRACK  67  XCP):  313 YCP):  303 XC:  197 YC:  255
0031       2        209 18:59:54:13  TRACK  68  XCP):  312 YCP):  295 XC:  197 YC:  255
0032       0        209 18:59:54:08  TRACK  69  XCP):  317 YCP):  295 XC:  198 YC:  254
0033       1        209 18:59:54:11  TRACK  70  XCP):  318 YCP):  291 XC:  198 YC:  253
0034       2        209 18:59:54:14  TRACK  71  XCP):  320 YCP):  286 XC:  197 YC:  254
0035       0        209 18:59:54:91  TRACK  72  XCP):  332 YCP):  283 XC:  200 YC:  254
0036       1        209 18:59:54:94  TRACK  73  XCP):  340 YCP):  281 XC:  200 YC:  254
0037       0        209 18:59:54:98  TRACK  74  XCP):  362 YCP):  279 XC:  201 YC:  254
0038       1        209 18:59:54:95  TRACK  75      NO SPOT
0039       0        209 18:59:55:05  TRACK  76  XCP):  401 YCP):  274 XC:  200 YC:  255
0040       1        209 18:59:55:09  TRACK  77  XCP):  420 YCP):  271 XC:  200 YC:  255
0041       2        209 18:59:55:11  TRACK  78  XCP):  434 YCP):  268 XC:  200 YC:  254
0042       3        209 18:59:55:15  TRACK  79      NO SPOT
0043       4        209 18:59:55:18  TRACK  80  XCP):  457 YCP):  263 XC:  200 YC:  255
0044       5        209 18:59:55:21  TRACK  81  XCP):  462 YCP):  267 XC:  200 YC:  254
0045       6        209 18:59:55:25  TRACK  82      NO SPOT
0046       7        209 18:59:55:28  TRACK  83  XCP):  460 YCP):  260 XC:  200 YC:  255
0047       8        209 18:59:55:31  TRACK  84      NO SPOT
0048       9        209 18:59:55:35  TRACK  85  XCP):  463 YCP):  250 XC:  201 YC:  255
0049      10        209 18:59:55:38  TRACK  86  XCP):  462 YCP):  257 XC:  201 YC:  255
0050      11        209 18:59:55:41  TRACK  87      NO SPOT
0051      12        209 18:59:55:45  TRACK  88  XCP):  455 YCP):  248 XC:  20.  Y.  ...
0052      13        209 18:59:55:48  TRACK  89  XCP):  455 YCP):  250 XC:  201 YC:  255
0053      14        209 18:59:55:51  TRACK  90      NO SPOT
0054      15        209 18:59:55:55  TRACK  91      NO SPOT
0055      16        209 18:59:55:58  TRACK  92      NO SPOT
0056      17        209 18:59:55:61  TRACK  93  XCP):  445 YCP):  247 XC:  2..  Y.  ...
0057      18        209 18:59:55:65  TRACK  94  XCP):  450 YCP):  245 XC:  2..  Y.  ...
0058      19        209 18:59:55:68  TRACK  95      NO SPOT
```

0059	20	209	18:59:55:71	TRACK	96	NO SPOT			
0060	21	209	18:59:55:75	TRACK	97	X(P): 444	Y(P): 24?	XC: [illegible]	YC: 25?
0061	22	209	18:59:55:78	TRACK	98	X(P): 441	Y(P): 247	XC: 20?	YC: 25?
0062	23	209	18:59:55:81	TRACK	99	X(P): 43?	Y(P): 246	XC: 199	YC: 254
0063	0	209	18:59:55:85	TRACK	100	X(P): 432	Y(P): 250	XC: 200	YC: 254
0064	1	209	18:59:55:88	TRACK	101	NO SPOT			
0065	2	209	18:59:55:91	TRACK	102	X(P): 424	Y(P): 253	XC: 199	YC: 254
0066	3	209	18:59:55:95	TRACK	103	NO SPOT			
0067	0	209	18:59:55:98	TRACK	53	X(P): 416	Y(P): 253	XC: 211	YC: 254
0068	1	209	18:59:56:01	TRACK	54	X(P): 417	Y(P): 255	XC: 211	YC: 254
0069	2	209	18:59:56:04	TRACK	55	X(P): 416	Y(P): 256	XC: 211	YC: 254
0070	3	209	18:59:56:08	TRACK	56	X(P): 413	Y(P): 254	XC: 211	YC: 254
0071	4	209	18:59:56:11	TRACK	57	X(P): 413	Y(P): 254	XC: 211	YC: 254
0072	5	209	18:59:56:14	TRACK	58	X(P): 412	Y(P): 254	XC: 211	YC: 254
0073	6	209	18:59:56:18	TRACK	59	X(P): 414	Y(P): 254	XC: 211	YC: 254
0074	7	209	18:59:56:21	TRACK	60	X(P): 414	Y(P): 251	XC: 211	YC: 254
0075	8	209	18:59:56:24	TRACK	61	X(P): 415	Y(P): 248	XC: 211	YC: 254
0076	9	209	18:59:56:28	TRACK	62	X(P): 415	Y(P): 245	XC: 211	YC: 254
0077	10	209	18:59:56:31	TRACK	63	X(P): 417	Y(P): 243	XC: 211	YC: 254
0078	11	209	18:59:56:34	TRACK	64	X(P): 420	Y(P): 240	XC: 211	YC: 254
0079	12	209	18:59:56:38	TRACK	65	X(P): 422	Y(P): 238	XC: 211	YC: 254
0080	13	209	18:59:56:41	TRACK	66	X(P): 423	Y(P): 236	XC: 211	YC: 254
0081	14	209	18:59:56:44	TRACK	67	NO SPOT			
0082	15	209	18:59:56:48	TRACK	68	X(P): 424	Y(P): 227	XC: 211	YC: 254
0083	16	209	18:59:56:51	TRACK	69	X(P): 425	Y(P): 236	XC: 211	YC: 254
0084	17	209	18:59:56:54	TRACK	70	X(P): 426	Y(P): 234	XC: 211	YC: 254
0085	18	209	18:59:56:58	TRACK	71	NO SPOT			
0086	19	209	18:59:56:61	TRACK	72	X(P): 424	Y(P): 230	XC: 211	YC: 254
0087	20	209	18:59:56:64	TRACK	73	X(P): 426	Y(P): 228	XC: 211	YC: 254
0088	21	209	18:59:56:68	TRACK	74	X(P): 425	Y(P): 226	XC: 211	YC: 254
0089	22	209	18:59:56:71	TRACK	75	X(P): 425	Y(P): 228	XC: 211	YC: 254
0090	23	209	18:59:56:74	TRACK	76	X(P): 425	Y(P): 229	XC: 211	YC: 254
0091	24	209	18:59:56:78	TRACK	77	NO SPOT			
0092	25	209	18:59:56:81	TRACK	78	X(P): 428	Y(P): 229	XC: 211	YC: 256
0093	26	209	18:59:56:84	TRACK	79	X(P): 432	Y(P): 230	XC: 211	YC: 256
0094	27	209	18:59:56:88	TRACK	80	X(P): 431	Y(P): 230	XC: 211	YC: 256
0095	28	209	18:59:56:91	TRACK	81	X(P): 432	Y(P): 23?	XC: 211	YC: 256
0096	29	209	18:59:56:94	TRACK	82	X(P): 434	Y(P): 229	XC: 211	YC: 256
0097	30	209	18:59:56:98	TRACK	83	X(P): 435	Y(P): 229	XC: 211	YC: 25?
0098	31	209	18:59:57:01	TRACK	84	X(P): 433	Y(P): 225	XC: 211	YC: 256
0099	32	209	18:59:57:04	TRACK	85	X(P): 432	Y(P): 229	XC: 211	YC: 256
0100	33	209	18:59:57:08	TRACK	86	X(P): 434	Y(P): 227	XC: 211	YC: 256
0101	34	209	18:59:57:11	TRACK	87	X(P): 434	Y(P): 228	XC: 211	YC: 256
0102	35	209	18:59:57:14	TRACK	88	X(P): 43?	Y(P): 228	XC: 211	YC: 256
0103	36	209	18:59:57:18	TRACK	89	X(P): 431	Y(P): 227	XC: 211	YC: 256
0104	37	209	18:59:57:21	TRACK	90	X(P): 431	Y(P): 228	XC: 211	YC: 256
0105	38	209	18:59:57:24	TRACK	91	X(P): 431	Y(P): 23?	XC: 211	YC: 256
0106	39	209	18:59:57:28	TRACK	92	X(P): 431	Y(P): 230	XC: 211	YC: 256
0107	40	209	18:59:57:31	TRACK	93	X(P): 432	Y(P): 229	XC: 211	YC: 256
0108	41	209	18:59:57:34	TRACK	94	NO SPOT			
0109	42	209	18:59:57:38	TRACK	95	X(P): 433	Y(P): 227	XC: 211	YC: 256
0110	43	209	18:59:57:41	TRACK	96	X(P): 433	Y(P): 227	XC: 211	YC: 256
0111	44	209	18:59:57:44	TRACK	97	X(P): 431	Y(P): 226	XC: 211	YC: [illegible]
0112	45	209	18:59:57:48	TRACK	98	NO SPOT			
0113	46	209	18:59:57:51	TRACK	99	X(P): 432	Y(P): 225	XC: 211	YC: 256
0114	47	209	18:59:57:54	TRACK	100	X(P): 432	Y(P): 226	XC: 211	YC: 256
0115	48	209	18:59:57:58	TRACK	101	X(P): 431	Y(P): 225	XC: 211	YC: 256
0116	49	209	18:59:57:61	TRACK	102	X(P): 430	Y(P): 225	XC: 211	YC: 256
0117	50	209	18:59:57:64	TRACK	103	X(P): 432	Y(P): 223	XC: 211	YC: 25?
0118	51	209	18:59:57:68	TRACK	104	X(P): 432	Y(P): 223	XC: 211	YC: 256

0119	52	209	18:59:57:71	TRACK 105	NO SPOT
0120	53	209	18:59:57:74	TRACK 106	X(P): 434 Y(P): 223 XC: 211 YC: 256
0121	54	209	18:59:57:78	TRACK 107	X(P): 435 Y(P): 223 XC: 211 YC: 256
0122	55	209	18:59:57:81	TRACK 108	X(P): 432 Y(P): 222 XC: 211 YC: 256
0123	56	209	18:59:57:84	TRACK 109	X(P): 433 Y(P): 223 XC: 211 YC: 256
0124	57	209	18:59:57:88	TRACK 110	X(P): 434 Y(P): 222 XC: 211 YC: 256
0125	58	209	18:59:57:91	TRACK 111	X(P): 433 Y(P): 222 XC: 211 YC: 256
0126	59	209	18:59:57:94	TRACK 112	X(P): 433 Y(P): 222 XC: 211 YC: 256
0127	60	209	18:59:57:98	TRACK 113	X(P): 433 Y(P): 220 XC: 211 YC: 256
0128	61	209	18:59:58:01	TRACK 114	X(P): 432 Y(P): 221 XC: 211 YC: 256
0129	62	209	18:59:58:04	TRACK 115	X(P): 432 Y(P): 221 XC: 211 YC: 256
0130	63	209	18:59:58:08	TRACK 116	NO SPOT
0131	64	209	18:59:58:11	TRACK 117	X(P): 431 Y(P): 221 XC: 211 YC: 256
0132	65	209	18:59:58:14	TRACK 118	NO SPOT
0133	66	209	18:59:58:18	TRACK 119	X(P): 431 Y(P): 222 XC: 211 YC: 256
0134	67	209	18:59:58:21	TRACK 120	NO SPOT
0135	68	209	18:59:58:24	TRACK 121	X(P): 437 Y(P): 220 XC: 211 YC: 256
0136	69	209	18:59:58:28	TRACK 122	X(P): 439 Y(P): 219 XC: 211 YC: 256
0137	0	209	18:59:58:32	TRACK 123	NO SPOT
0138	1	209	18:59:58:35	TRACK 124	NO SPOT
0139	2	209	18:59:58:38	TRACK 125	NO SPOT
0140	3	209	18:59:58:42	TRACK 126	NO SPOT
0141	4	209	18:59:58:45	TRACK 127	X(P): 507 Y(P): 219 XC: 231 YC: 252
0142	5	209	18:59:58:48	TRACK 128	NO SPOT
0143	0	209	18:59:58:52	TRACK 129	X(P): 453 Y(P): 218 XC: 201 YC: 252
0144	1	209	18:59:58:55	TRACK 130	NO SPOT
0145	2	209	18:59:58:58	TRACK 131	X(P): 454 Y(P): 218 XC: 201 YC: 254
0146	3	209	18:59:58:62	TRACK 132	NO SPOT
0147	4	209	18:59:58:65	TRACK 133	X(P): 454 Y(P): 218 XC: 201 YC: 254
0148	0	209	18:59:58:69	TRACK 134	X(P): 436 Y(P): 218 XC: 201 YC: 254
0149	6	209	18:59:58:72	TRACK 135	NO SPOT
0150	0	209	18:59:58:75	TRACK 136	X(P): 436 Y(P): 218 XC: 202 YC: 254
0151	15	209	18:59:59:02	TRACK 144	NO SPOT
0152	7	209	18:59:58:78	TRACK 137	X(P): 450 Y(P): 220 XC: 201 YC: 254
0153	1	209	18:59:58:81	TRACK 138	X(P): 450 Y(P): 219 XC: 201 YC: 254
0154	2	209	18:59:58:84	TRACK 139	X(P): 447 Y(P): 221 XC: 201 YC: 254
0155	3	209	18:59:58:88	TRACK 140	X(P): 445 Y(P): 221 XC: 200 YC: 254
0156	4	209	18:59:58:91	TRACK 141	X(P): 444 Y(P): 221 XC: 201 YC: 254
0157	5	209	18:59:58:94	TRACK 142	X(P): 444 Y(P): 221 XC: 201 YC: 254
0158	6	209	18:59:58:98	TRACK 143	X(P): 442 Y(P): 221 XC: 200 YC: 254
0159	7	209	18:59:59:01	TRACK 144	X(P): 442 Y(P): 220 XC: 200 YC: 254
0160	15	209	18:59:59:05	TRACK 145	NO SPOT
0161	0	209	18:59:59:28	TRACK 146	X(P): 434 Y(P): 220 XC: 201 YC: 255
0162	1	209	18:59:59:31	TRACK 147	X(P): 436 Y(P): 221 XC: 201 YC: 255
0163	2	209	18:59:59:34	TRACK 148	X(P): 436 Y(P): 222 XC: 201 YC: 255
0164	3	209	18:59:59:38	TRACK 149	NO SPOT
0165	4	209	18:59:59:41	TRACK 150	NO SPOT
0166	5	209	18:59:59:44	TRACK 151	X(P): 436 Y(P): 221 XC: 201 YC: 255
0167	6	209	18:59:59:48	TRACK 152	X(P): 437 Y(P): 221 XC: 201 YC: 255
0168	7	209	18:59:59:51	TRACK 153	NO SPOT
0169	8	209	18:59:59:54	TRACK 154	NO SPOT
0170	9	209	18:59:59:58	TRACK 155	X(P): 437 Y(P): 220 XC: 201 YC: 255
0171	10	209	18:59:59:61	TRACK 156	X(P): 442 Y(P): 219 XC: 201 YC: 255
0172	11	209	18:59:59:64	TRACK 157	X(P): 436 Y(P): 220 XC: 201 YC: 255
0173	12	209	18:59:59:68	TRACK 158	X(P): 443 Y(P): 219 XC: 201 YC: 255
0174	13	209	18:59:59:71	TRACK 159	NO SPOT
0175	14	209	18:59:59:74	TRACK 160	NO SPOT
0176	15	209	18:59:59:78	TRACK 161	X(P): 437 Y(P): 218 XC: 201 YC: 255
0177	16	209	18:59:59:81	TRACK 162	X(P): 449 Y(P): 219 XC: 201 YC: 255
0178	0	209	18:59:59:84	TRACK 163	X(P): 432 Y(P): 218 XC: 202 YC: 254

0179	0	209	18:59:59:88	TRACK 164	X(P):	436	Y(P):	218	XC:	201	YC:	254
0180	1	209	18:59:59:91	TRACK 165	X(P):	438	Y(P):	219	XC:	201	YC:	254
0181	2	209	18:59:59:94	TRACK 166	X(P):	437	Y(P):	220	XC:	201	YC:	254
0182	3	209	18:59:59:98	TRACK 167	X(P):	436	Y(P):	219	XC:	201	YC:	254
0183	4	209	19:00:00:01	TRACK 168	X(P):	435	Y(P):	219	XC:	201	YC:	254
0184	5	209	19:00:00:04	TRACK 169	X(P):	436	Y(P):	219	XC:	201	YC:	254
0185	6	209	19:00:00:08	TRACK 170	X(P):	436	Y(P):	219	XC:	201	YC:	254
0186	7	209	19:00:00:11	TRACK 171	X(P):	437	Y(P):	219	XC:	201	YC:	254
0187	8	209	19:00:00:14	TRACK 172	NO SPOT							
0188	9	209	19:00:00:18	TRACK 173	X(P):	435	Y(P):	219	XC:	201	YC:	254
0189	10	209	19:00:00:21	TRACK 174	X(P):	435	Y(P):	219	XC:	201	YC:	254
0190	11	209	19:00:00:24	TRACK 175	X(P):	436	Y(P):	219	XC:	201	YC:	254
0191	12	209	19:00:00:28	TRACK 176	NO SPOT							
0192	13	209	19:00:00:31	TRACK 177	X(P):	435	Y(P):	219	XC:	201	YC:	254
0193	14	209	19:00:00:34	TRACK 178	X(P):	435	Y(P):	219	XC:	201	YC:	254
0194	15	209	19:00:00:38	TRACK 179	NO SPOT							
0195	16	209	19:00:00:41	TRACK 180	X(P):	436	Y(P):	220	XC:	201	YC:	254
0196	17	209	19:00:00:44	TRACK 181	X(P):	436	Y(P):	220	XC:	201	YC:	254
0197	18	209	19:00:00:48	TRACK 182	X(P):	436	Y(P):	220	XC:	201	YC:	254
0198	19	209	19:00:00:51	TRACK 183	X(P):	436	Y(P):	219	XC:	201	YC:	254
0199	20	209	19:00:00:54	TRACK 184	X(P):	436	Y(P):	220	XC:	201	YC:	254
0200	21	209	19:00:00:58	TRACK 185	X(P):	437	Y(P):	220	XC:	201	YC:	254
0201	22	209	19:00:00:61	TRACK 186	X(P):	437	Y(P):	219	XC:	201	YC:	254
0202	23	209	19:00:00:64	TRACK 187	X(P):	437	Y(P):	219	XC:	201	YC:	254
0203	24	209	19:00:00:68	TRACK 188	X(P):	438	Y(P):	220	XC:	201	YC:	254
0204	25	209	19:00:00:71	TRACK 189	X(P):	436	Y(P):	219	XC:	201	YC:	254
0205	26	209	19:00:00:74	TRACK 190	X(P):	436	Y(P):	219	XC:	201	YC:	254
0206	27	209	19:00:00:78	TRACK 191	X(P):	436	Y(P):	219	XC:	201	YC:	254
0207	28	209	19:00:00:81	TRACK 192	X(P):	437	Y(P):	219	XC:	201	YC:	254
0208	29	209	19:00:00:84	TRACK 193	X(P):	437	Y(P):	220	XC:	201	YC:	254
0209	30	209	19:00:00:88	TRACK 194	X(P):	438	Y(P):	220	XC:	201	YC:	254
0210	31	209	19:00:00:91	TRACK 195	NO SPOT							
0211	32	209	19:00:00:94	TRACK 196	X(P):	438	Y(P):	220	XC:	201	YC:	254
0212	33	209	19:00:00:98	TRACK 197	X(P):	439	Y(P):	219	XC:	201	YC:	254
0213	34	209	19:00:01:01	TRACK 198	X(P):	436	Y(P):	219	XC:	201	YC:	254
0214	35	209	19:00:01:04	TRACK 199	X(P):	439	Y(P):	219	XC:	201	YC:	254
0215	36	209	19:00:01:08	TRACK 200	X(P):	437	Y(P):	220	XC:	201	YC:	254
0216	37	209	19:00:01:11	TRACK 201	NO SPOT							
0217	38	209	19:00:01:14	TRACK 202	NO SPOT							
0218	39	209	19:00:01:18	TRACK 203	NO SPOT							
0219	40	209	19:00:01:21	TRACK 204	X(P):	436	Y(P):	220	XC:	201	YC:	254
0220	41	209	19:00:01:24	TRACK 205	X(P):	437	Y(P):	219	XC:	201	YC:	254
0221	42	209	19:00:01:28	TRACK 206	X(P):	438	Y(P):	219	XC:	201	YC:	254
0222	43	209	19:00:01:31	TRACK 207	NO SPOT							
0223	44	209	19:00:01:34	TRACK 208	X(P):	437	Y(P):	220	XC:	201	YC:	254
0224	45	209	19:00:01:38	TRACK 209	X(P):	437	Y(P):	218	XC:	201	YC:	254
0225	46	209	19:00:01:41	TRACK 210	NO SPOT							
0226	47	209	19:00:01:44	TRACK 211	X(P):	438	Y(P):	218	XC:	201	YC:	254
0227	48	209	19:00:01:48	TRACK 212	X(P):	436	Y(P):	218	XC:	201	YC:	254
0228	49	209	19:00:01:51	TRACK 213	X(P):	437	Y(P):	218	XC:	201	YC:	254
0229	50	209	19:00:01:54	TRACK 214	X(P):	436	Y(P):	218	XC:	201	YC:	254
0230	51	209	19:00:01:58	TRACK 215	X(P):	436	Y(P):	218	XC:	201	YC:	254
0231	52	209	19:00:01:61	TRACK 216	X(P):	435	Y(P):	218	XC:	201	YC:	254
0232	53	209	19:00:01:64	TRACK 217	X(P):	436	Y(P):	219	XC:	201	YC:	254
0233	54	209	19:00:01:68	TRACK 218	X(P):	436	Y(P):	219	XC:	201	YC:	254
0234	55	209	19:00:01:71	TRACK 219	X(P):	436	Y(P):	218	XC:	201	YC:	254
0235	56	209	19:00:01:74	TRACK 220	X(P):	437	Y(P):	217	XC:	201	YC:	254
0236	57	209	19:00:01:78	TRACK 221	X(P):	435	Y(P):	219	XC:	201	YC:	254
0237	58	209	19:00:01:81	TRACK 222	X(P):	437	Y(P):	219	XC:	201	YC:	254
0238	59	209	19:00:01:84	TRACK 223	X(P):	437	Y(P):	219	XC:	201	YC:	254

0239	60	209	19:00:01:88	TRACK 224	X(P): 437	Y(P): 219	XC: 201	YC: 254		
0240	61	209	19:00:01:91	TRACK 225	X(P): 436	Y(P): 219	XC: 201	YC: 254		
0241	62	209	19:00:01:94	TRACK 226	X(P): 436	Y(P): 220	XC: 201	YC: 254		
0242	63	209	19:00:01:98	TRACK 227	X(P): 436	Y(P): 220	XC: 201	YC: 254		
0243	64	209	19:00:02:01	TRACK 228	X(P): 435	Y(P): 219	XC: 201	YC: 254		
0244	65	209	19:00:02:04	TRACK 229	X(P): 434	Y(P): 219	XC: 201	YC: 254		
0245	66	209	19:00:02:08	TRACK 230	X(P): 435	Y(P): 218	XC: 201	YC: 254		
0246	67	209	19:00:02:11	TRACK 231	X(P): 434	Y(P): 219	XC: 201	YC: 254		
0247	68	209	19:00:02:14	TRACK 232	X(P): 434	Y(P): 219	XC: 201	YC: 254		
0248	69	209	19:00:02:18	TRACK 233	NO SPOT					
0249	70	209	19:00:02:21	TRACK 234	X(P): 434	Y(P): 219	XC: 201	YC: 254		
0250	71	209	19:00:02:24	TRACK 235	NO SPOT					
0251	72	209	19:00:02:28	TRACK 236	NO SPOT					
0252	73	209	19:00:02:31	TRACK 237	X(P): 436	Y(P): 218	XC: 201	YC: 254		
0253	74	209	19:00:02:34	TRACK 238	X(P): 436	Y(P): 218	XC: 201	YC: 254		
0254	75	209	19:00:02:38	TRACK 239	X(P): 435	Y(P): 219	XC: 201	YC: 254		
0255	76	209	19:00:02:41	TRACK 240	X(P): 436	Y(P): 220	XC: 201	YC: 254		
0256	77	209	19:00:02:44	TRACK 241	X(P): 436	Y(P): 219	XC: 201	YC: 254		
0257	78	209	19:00:02:48	TRACK 242	NO SPOT					
0258	79	209	19:00:02:51	TRACK 243	X(P): 437	Y(P): 218	XC: 201	YC: 254		
0259	80	209	19:00:02:54	TRACK 244	X(P): 435	Y(P): 218	XC: 201	YC: 254		
0260	81	209	19:00:02:58	TRACK 245	X(P): 435	Y(P): 217	XC: 201	YC: 254		
0261	82	209	19:00:02:61	TRACK 246	NO SPOT					
0262	83	209	19:00:02:64	TRACK 247	NO SPOT					
0263	84	209	19:00:02:68	TRACK 248	X(P): 436	Y(P): 217	XC: 201	YC: 254		
0264	85	209	19:00:02:71	TRACK 249	X(P): 437	Y(P): 216	XC: 201	YC: 254		
0265	86	209	19:00:02:74	TRACK 250	X(P): 436	Y(P): 218	XC: 201	YC: 254		
0266	87	209	19:00:02:78	TRACK 251	X(P): 436	Y(P): 217	XC: 201	YC: 254		
0267	88	209	19:00:02:81	TRACK 252	X(P): 437	Y(P): 217	XC: 201	YC: 254		
0268	89	209	19:00:02:84	TRACK 253	X(P): 437	Y(P): 216	XC: 201	YC: 254		
0269	90	209	19:00:02:88	TRACK 254	X(P): 436	Y(P): 218	XC: 201	YC: 254		
0270	91	209	19:00:02:91	TRACK 255	X(P): 437	Y(P): 218	XC: 201	YC: 254		
0271	92	209	19:00:02:94	TRACK 256	NO SPOT					
0272	93	209	19:00:02:98	TRACK 257	X(P): 438	Y(P): 217	XC: 201	YC: 254		
0273	94	209	19:00:03:01	TRACK 258	X(P): 437	Y(P): 216	XC: 201	YC: 254		
0274	95	209	19:00:03:04	TRACK 259	X(P): 437	Y(P): 216	XC: 201	YC: 254		
0275	96	209	19:00:03:08	TRACK 260	X(P): 437	Y(P): 216	XC: 201	YC: 254		
0276	97	209	19:00:03:11	TRACK 261	NO SPOT					
0277	98	209	19:00:03:14	TRACK 262	X(P): 437	Y(P): 217	XC: 201	YC: 254		
0278	99	209	19:00:03:18	TRACK 263	X(P): 437	Y(P): 217	XC: 201	YC: 254		
0279	100	209	19:00:03:21	TRACK 264	X(P): 437	Y(P): 216	XC: 201	YC: 254		
0280	101	209	19:00:03:24	TRACK 265	NO SPOT					
0281	102	209	19:00:03:28	TRACK 266	X(P): 435	Y(P): 216	XC: 201	YC: 254		
0282	103	209	19:00:03:31	TRACK 267	NO SPOT					
0283	104	209	19:00:03:34	TRACK 268	NO SPOT					
0284	105	209	19:00:03:38	TRACK 269	X(P): 438	Y(P): 217	XC: 201	YC: 254		
0285	106	209	19:00:03:41	TRACK 270	NO SPOT					
0286	107	209	19:00:03:44	TRACK 271	X(P): 437	Y(P): 217	XC: 201	YC: 254		
0287	108	209	19:00:03:48	TRACK 272	X(P): 437	Y(P): 217	XC: 201	YC: 254		
0288	109	209	19:00:03:51	TRACK 273	X(P): 438	Y(P): 217	XC: 201	YC: 254		
0289	110	209	19:00:03:54	TRACK 274	NO SPOT					
0290	111	209	19:00:03:58	TRACK 275	NO SPOT					
0291	112	209	19:00:03:61	TRACK 276	X(P): 439	Y(P): 221	XC: 201	YC: 254		
0292	113	209	19:00:03:64	TRACK 277	X(P): 437	Y(P): 217	XC: 201	YC: 254		
0293	114	209	19:00:03:68	TRACK 278	X(P): 438	Y(P): 216	XC: 201	YC: 254		
0294	115	209	19:00:03:71	TRACK 279	NO SPOT					
0295	116	209	19:00:03:74	TRACK 280	NO SPOT					
0296	117	209	19:00:03:78	TRACK 281	X(P): 437	Y(P): 217	XC: 201	YC: 254		
0297	118	209	19:00:03:81	TRACK 282	X(P): 436	Y(P): 217	XC: 201	YC: 254		
0298	119	209	19:00:03:84	TRACK 283	X(P): 438	Y(P): 217	XC: 201	YC: 254		

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0299   120        209 19:00:03:88  TRACK 284  X(P): 437 Y(P): 217 XC: 201 YC: 254
0300   121        209 19:00:03:91  TRACK 285  X(P): 436 Y(P): 216 XC: 201 YC: 254
0301   122        209 19:00:03:94  TRACK 286  X(P): 437 Y(P): 216 XC: 201 YC: 254
0302   123        209 19:00:03:98  TRACK 287  X(P): 437 Y(P): 216 XC: 201 YC: 254
0303   124        209 19:00:04:01  TRACK 288     NO SPOT
0304   125        209 19:00:04:04  TRACK 289     NO SPOT
0305   126        209 19:00:04:08  TRACK 290     NO SPOT
0306   127        209 19:00:04:11  TRACK 291  X(P): 437 Y(P): 216 XC: 201 YC: 254
0307   128        209 19:00:04:14  TRACK 292     NO SPOT
0308   129        209 19:00:04:18  TRACK 293     NO SPOT
0309   130        209 19:00:04:21  TRACK 294     NO SPOT
0310   131        209 19:00:04:24  TRACK 295     NO SPOT
0311   132        209 19:00:04:28  TRACK 296     NO SPOT
0312   133        209 19:00:04:31  TRACK 297     NO SPOT
0313   134        209 19:00:04:34  TRACK 298  X(P): 436 Y(P): 216 XC: 201 YC: 254
0314   135        209 19:00:04:38  TRACK 299  X(P): 437 Y(P): 216 XC: 201 YC: 254
0315     0        209 19:00:04:39  TRACK  13     NO SPOT
0316     1        209 19:00:04:42  TRACK  14     NO SPOT
0317     2        209 19:00:04:45  TRACK  15     NO SPOT
0318     3        209 19:00:04:49  TRACK  16     NO SPOT
0319     4        209 19:00:04:52  TRACK  17  X(P): 436 Y(P): 215 XC: 199 YC: 256
0320     0        209 19:00:04:55  TRACK  18  X(P): 436 Y(P): 215 XC: 200 YC: 254
0321     1        209 19:00:04:58  TRACK  19     NO SPOT
0322     2        209 19:00:04:61  TRACK  20  X(P): 435 Y(P): 215 XC: 200 YC: 254
0323     3        209 19:00:04:65  TRACK  21     NO SPOT
0324     4        209 19:00:04:68  TRACK  22     NO SPOT
0325     5        209 19:00:04:71  TRACK  23     NO SPOT
0326     6        209 19:00:04:75  TRACK  24     NO SPOT
0327     7        209 19:00:04:78  TRACK  25     NO SPOT
0328     8        209 19:00:04:81  TRACK  26     NO SPOT
0329     9        209 19:00:04:85  TRACK  27  X(P): 435 Y(P): 213 XC: 200 YC: 254
0330    10        209 19:00:04:88  TRACK  28  X(P): 436 Y(P): 214 XC: 200 YC: 254
0331     0        209 19:00:04:91  TRACK  29  X(P): 436 Y(P): 213 XC: 200 YC: 253
0332     1        209 19:00:04:94  TRACK  30     NO SPOT
0333     2        209 19:00:04:97  TRACK  31  X(P): 435 Y(P): 214 XC: 200 YC: 253
0334     0        209 19:00:05:00  TRACK  32  X(P): 435 Y(P): 215 XC: 201 YC: 254
0335     1        209 19:00:05:03  TRACK  33     NO SPOT
0336     2        209 19:00:05:06  TRACK  34  X(P): 435 Y(P): 214 XC: 201 YC: 254
0337     3        209 19:00:05:10  TRACK  35  X(P): 435 Y(P): 213 XC: 201 YC: 254
0338     4        209 19:00:05:13  TRACK  36  X(P): 435 Y(P): 213 XC: 201 YC: 254
0339     5        209 19:00:05:16  TRACK  37     NO SPOT
0340     6        209 19:00:05:20  TRACK  38     NO SPOT
0341     7        209 19:00:05:23  TRACK  39     NO SPOT
0342     8        209 19:00:05:26  TRACK  40  X(P): 436 Y(P): 213 XC: 201 YC: 254
0343     9        209 19:00:05:30  TRACK  41     NO SPOT
0344    10        209 19:00:05:33  TRACK  42     NO SPOT
0345    11        209 19:00:05:36  TRACK  43  X(P): 437 Y(P): 211 XC: 201 YC: 254
0346    12        209 19:00:05:40  TRACK  44  X(P): 439 Y(P): 210 XC: 201 YC: 254
0347    13        209 19:00:05:43  TRACK  45     NO SPOT
0348    14        209 19:00:05:46  TRACK  46     NO SPOT
0349    15        209 19:00:05:50  TRACK  47  X(P): 437 Y(P): 209 XC: 201 YC: 254
0350    16        209 19:00:05:53  TRACK  48     NO SPOT
0351    17        209 19:00:05:56  TRACK  49     NO SPOT
0352    18        209 19:00:05:60  TRACK  50  X(P): 435 Y(P): 208 XC: 201 YC: 254
0353    19        209 19:00:05:63  TRACK  51  X(P): 436 Y(P): 206 XC: 201 YC: 254
0354    20        209 19:00:05:66  TRACK  52  X(P): 437 Y(P): 205 XC: 201 YC: 254
0355    21        209 19:00:05:70  TRACK  53  X(P): 439 Y(P): 205 XC: 201 YC: 254
0356    22        209 19:00:05:73  TRACK  54     NO SPOT
0357    23        209 19:00:05:76  TRACK  55  X(P): 439 Y(P): 204 XC: 201 YC: 254
0358    24        209 19:00:05:80  TRACK  56  X(P): 441 Y(P): 202 XC: 201 YC: 254
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0359     25        209 19:00:05:83   TRACK  57   X(P): 444 Y(P): 211 XC: 201 YC: 254
0360     26        209 19:00:05:86   TRACK  58   X(P): 442 Y(P): 199 XC: 201 YC: 254
0361      0        209 19:00:05:94   TRACK  60   X(P): 437 Y(P): 209 XC: 199 YC: 255
0362      1        209 19:00:05:97   TRACK  61      NO SPOT
0363      2        209 19:00:06:00   TRACK  62      NO SPOT
0364      3        209 19:00:06:04   TRACK  63      NO SPOT
0365      4        209 19:00:06:07   TRACK  64      NO SPOT
0366      5        209 19:00:06:10   TRACK  65      NO SPOT
0367      6        209 19:00:06:14   TRACK  66      NO SPOT
0368      0        209 19:00:06:16   TRACK  67      NO SPOT
0369      1        209 19:00:06:19   TRACK  68      NO SPOT
0370      2        209 19:00:06:22   TRACK  69      NO SPOT
0371      3        209 19:00:06:26   TRACK  70      NO SPOT
0372      4        209 19:00:06:29   TRACK  71      NO SPOT
0373      5        209 19:00:06:32   TRACK  72      NO SPOT
0374      6        209 19:00:06:36   TRACK  73      NO SPOT
0375      7        209 19:00:06:39   TRACK  74   X(P): 439 Y(P): 211 XC: 203 YC: 256
0376      8        209 19:00:06:42   TRACK  75      NO SPOT
0377      9        209 19:00:06:46   TRACK  76      NO SPOT
0378      0        209 19:00:06:51   TRACK  77      NO SPOT
0379      1        209 19:00:06:54   TRACK  78      NO SPOT
0380      2        209 19:00:06:57   TRACK  79      NO SPOT
0381      3        209 19:00:06:61   TRACK  80      NO SPOT
0382      0        209 19:00:06:66   TRACK  81   X(P): 437 Y(P): 211 XC: 200 YC: 255
0383      1        209 19:00:06:69   TRACK  82      NO SPOT
0384      2        209 19:00:06:72   TRACK  83   X(P): 439 Y(P): 209 XC: 200 YC: 255
0385      3        209 19:00:06:76   TRACK  84      NO SPOT
0386      4        209 19:00:06:79   TRACK  85   X(P): 438 Y(P): 210 XC: 200 YC: 255
0387      5        209 19:00:06:82   TRACK  86      NO SPOT
0388      6        209 19:00:06:86   TRACK  87   X(P): 437 Y(P): 211 XC: 200 YC: 255
0389      7        209 19:00:06:89   TRACK  88      NO SPOT
0390      8        209 19:00:06:92   TRACK  89   X(P): 438 Y(P): 209 XC: 200 YC: 255
0391      9        209 19:00:06:96   TRACK  90      NO SPOT
0392     10        209 19:00:06:99   TRACK  91      NO SPOT
0393     11        209 19:00:07:02   TRACK  92      NO SPOT
0394     12        209 19:00:07:06   TRACK  93      NO SPOT
0395     13        209 19:00:07:09   TRACK  94      NO SPOT
0396     14        209 19:00:07:12   TRACK  95   X(P): 437 Y(P): 210 XC: 200 YC: 255
0397     15        209 19:00:07:16   TRACK  96   X(P): 438 Y(P): 210 XC: 200 YC: 255
0398     16        209 19:00:07:19   TRACK  97   X(P): 439 Y(P): 211 XC: 200 YC: 255
0399     17        209 19:00:07:22   TRACK  98      NO SPOT
0400     18        209 19:00:07:26   TRACK  99      NO SPOT
0401     19        209 19:00:07:29   TRACK 100      NO SPOT
0402     20        209 19:00:07:32   TRACK 101      NO SPOT
0403     21        209 19:00:07:36   TRACK 102   X(P): 437 Y(P): 211 XC: 200 YC: 255
0404     22        209 19:00:07:39   TRACK 103   X(P): 437 Y(P): 212 XC: 200 YC: 255
0405     23        209 19:00:07:42   TRACK 104      NO SPOT
0406     24        209 19:00:07:46   TRACK 105   X(P): 437 Y(P): 211 XC: 200 YC: 255
0407      0        209 19:00:07:49   TRACK 106   X(P): 437 Y(P): 211 XC: 203 YC: 255
0408     26        209 19:00:07:52   TRACK 107      NO SPOT
0409     27        209 19:00:07:56   TRACK 108      NO SPOT
0410     28        209 19:00:07:59   TRACK 109      NO SPOT
0411     29        209 19:00:07:62   TRACK 110   X(P): 436 Y(P): 211 XC: 200 YC: 255
0412     30        209 19:00:07:66   TRACK 111      NO SPOT
0413     31        209 19:00:07:69   TRACK 112   X(P): 437 Y(P): 211 XC: 200 YC: 255
0414     32        209 19:00:07:72   TRACK 113   X(P): 436 Y(P): 211 XC: 200 YC: 255
0415      8        209 19:00:07:75   TRACK 114   X(P): 436 Y(P): 210 XC: 203 YC: 255
0416     34        209 19:00:07:79   TRACK 115      NO SPOT
0417     35        209 19:00:07:82   TRACK 116      NO SPOT
0418     36        209 19:00:07:86   TRACK 117      NO SPOT
```

0419	37	209	19:00:07:89	TRACK 118	NO SPOT
0420	38	209	19:00:07:92	TRACK 119	X(P): 436 Y(P): 209 XC: 200 YC: 255
0421	39	209	19:00:07:96	TRACK 120	NO SPOT
0422	40	209	19:00:07:99	TRACK 121	X(P): 437 Y(P): 210 XC: 200 YC: 255
0423	41	209	19:00:08:02	TRACK 122	NO SPOT
0424	42	209	19:00:08:06	TRACK 123	NO SPOT
0425	43	209	19:00:08:09	TRACK 124	X(P): 437 Y(P): 209 XC: 200 YC: 255
0426	44	209	19:00:08:12	TRACK 125	NO SPOT
0427	45	209	19:00:08:16	TRACK 126	NO SPOT
0428	46	209	19:00:08:19	TRACK 127	NO SPOT
0429	47	209	19:00:08:22	TRACK 128	X(P): 437 Y(P): 209 XC: 200 YC: 255
0430	48	209	19:00:08:26	TRACK 129	NO SPOT
0431	49	209	19:00:08:29	TRACK 130	NO SPOT
0432	50	209	19:00:08:32	TRACK 131	NO SPOT
0433	51	209	19:00:08:36	TRACK 132	NO SPOT
0434	52	209	19:00:08:39	TRACK 133	NO SPOT
0435	28	209	19:00:08:42	TRACK 134	X(P): 437 Y(P): 211 XC: 203 YC: 255
0436	55	209	19:00:08:49	TRACK 136	NO SPOT
0437	56	209	19:00:08:52	TRACK 137	NO SPOT
0438	57	209	19:00:08:56	TRACK 138	NO SPOT
0439	58	209	19:00:08:59	TRACK 139	NO SPOT
0440	59	209	19:00:08:62	TRACK 140	NO SPOT
0441	60	209	19:00:08:66	TRACK 141	X(P): 438 Y(P): 209 XC: 200 YC: 255
0442	61	209	19:00:08:69	TRACK 142	NO SPOT
0443	62	209	19:00:08:72	TRACK 143	NO SPOT
0444	63	209	19:00:08:76	TRACK 144	X(P): 436 Y(P): 210 XC: 200 YC: 255
0445	64	209	19:00:08:79	TRACK 145	NO SPOT
0446	65	209	19:00:08:82	TRACK 146	X(P): 436 Y(P): 210 XC: 200 YC: 255
0447	66	209	19:00:08:86	TRACK 147	NO SPOT
0448	68	209	19:00:08:92	TRACK 149	NO SPOT
0449	44	209	19:00:08:95	TRACK 150	X(P): 437 Y(P): 210 XC: 203 YC: 255
0450	70	209	19:00:08:99	TRACK 151	X(P): 436 Y(P): 213 XC: 200 YC: 255
0451	71	209	19:00:09:02	TRACK 152	NO SPOT
0452	72	209	19:00:09:06	TRACK 153	X(P): 436 Y(P): 210 XC: 200 YC: 255
0453	73	209	19:00:09:09	TRACK 154	NO SPOT
0454	74	209	19:00:09:12	TRACK 155	NO SPOT
0455	75	209	19:00:09:16	TRACK 156	NO SPOT
0456	76	209	19:00:09:19	TRACK 157	NO SPOT
0457	77	209	19:00:09:22	TRACK 158	NO SPOT
0458	78	209	19:00:09:26	TRACK 159	NO SPOT
0459	79	209	19:00:09:29	TRACK 160	NO SPOT
0460	80	209	19:00:09:32	TRACK 161	NO SPOT
0461	81	209	19:00:09:36	TRACK 162	NO SPOT
0462	82	209	19:00:09:39	TRACK 163	NO SPOT
0463	83	209	19:00:09:42	TRACK 164	NO SPOT
0464	84	209	19:00:09:46	TRACK 165	NO SPOT
0465	85	209	19:00:09:49	TRACK 166	NO SPOT
0466	86	209	19:00:09:52	TRACK 167	NO SPOT
0467	87	209	19:00:09:56	TRACK 168	NO SPOT
0468	88	209	19:00:09:59	TRACK 169	NO SPOT
0469	64	209	19:00:09:62	TRACK 170	X(P): 437 Y(P): 210 XC: 203 YC: 255
0470	65	209	19:00:09:65	TRACK 171	X(P): 437 Y(P): 210 XC: 203 YC: 255
0471	91	209	19:00:09:69	TRACK 172	NO SPOT
0472	92	209	19:00:09:72	TRACK 173	X(P): 437 Y(P): 208 XC: 200 YC: 255
0473	93	209	19:00:09:76	TRACK 174	NO SPOT
0474	94	209	19:00:09:79	TRACK 175	NO SPOT
0475	70	209	19:00:09:82	TRACK 176	X(P): 438 Y(P): 209 XC: 203 YC: 255
0476	96	209	19:00:09:86	TRACK 177	NO SPOT
0477	97	209	19:00:09:89	TRACK 178	NO SPOT
0478	98	209	19:00:09:92	TRACK 179	NO SPOT

0479	99	209	19:00:09:96	TRACK 180	X(P): 436 Y(P): 210 XC: 200 YC: 255
0480	100	209	19:00:09:99	TRACK 181	NO SPOT
0481	101	209	19:00:10:02	TRACK 182	NO SPOT
0482	102	209	19:00:10:06	TRACK 183	NO SPOT
0483	103	209	19:00:10:09	TRACK 184	NO SPOT
0484	104	209	19:00:10:12	TRACK 185	NO SPOT
0485	105	209	19:00:10:16	TRACK 186	X(P): 437 Y(P): 211 XC: 200 YC: 255
0486	106	209	19:00:10:19	TRACK 187	NO SPOT
0487	107	209	19:00:10:22	TRACK 188	NO SPOT
0488	108	209	19:00:10:26	TRACK 189	X(P): 436 Y(P): 212 XC: 200 YC: 255
0489	109	209	19:00:10:29	TRACK 190	NO SPOT
0490	110	209	19:00:10:32	TRACK 191	NO SPOT
0491	111	209	19:00:10:36	TRACK 192	NO SPOT
0492	112	209	19:00:10:39	TRACK 193	NO SPOT
0493	113	209	19:00:10:42	TRACK 194	X(P): 437 Y(P): 212 XC: 200 YC: 255
0494	114	209	19:00:10:46	TRACK 195	X(P): 437 Y(P): 211 XC: 200 YC: 255
0495	115	209	19:00:10:49	TRACK 196	X(P): 436 Y(P): 212 XC: 200 YC: 255
0496	116	209	19:00:10:52	TRACK 197	X(P): 437 Y(P): 210 XC: 200 YC: 255
0497	117	209	19:00:10:56	TRACK 198	NO SPOT
0498	118	209	19:00:10:59	TRACK 199	NO SPOT
0499	119	209	19:00:10:62	TRACK 200	NO SPOT
0500	120	209	19:00:10:66	TRACK 201	X(P): 436 Y(P): 210 XC: 200 YC: 255
0501	121	209	19:00:10:69	TRACK 202	NO SPOT
0502	122	209	19:00:10:72	TRACK 203	NO SPOT
0503	123	209	19:00:10:76	TRACK 204	X(P): 436 Y(P): 210 XC: 200 YC: 255
0504	124	209	19:00:10:79	TRACK 205	NO SPOT
0505	125	209	19:00:10:82	TRACK 206	NO SPOT
0506	126	209	19:00:10:86	TRACK 207	NO SPOT
0507	127	209	19:00:10:89	TRACK 208	NO SPOT
0508	128	209	19:00:10:92	TRACK 209	NO SPOT
0509	129	209	19:00:10:96	TRACK 210	X(P): 438 Y(P): 210 XC: 200 YC: 255
0510	130	209	19:00:10:99	TRACK 211	NO SPOT
0511	131	209	19:00:11:02	TRACK 212	X(P): 438 Y(P): 210 XC: 200 YC: 255
0512	132	209	19:00:11:06	TRACK 213	NO SPOT
0513	133	209	19:00:11:09	TRACK 214	X(P): 437 Y(P): 210 XC: 200 YC: 255
0514	134	209	19:00:11:12	TRACK 215	NO SPOT
0515	135	209	19:00:11:16	TRACK 216	X(P): 438 Y(P): 209 XC: 200 YC: 255
0516	136	209	19:00:11:19	TRACK 217	NO SPOT
0517	137	209	19:00:11:22	TRACK 218	X(P): 436 Y(P): 210 XC: 200 YC: 255
0518	138	209	19:00:11:26	TRACK 219	NO SPOT
0519	139	209	19:00:11:29	TRACK 220	NO SPOT
0520	140	209	19:00:11:32	TRACK 221	NO SPOT
0521	141	209	19:00:11:36	TRACK 222	NO SPOT
0522	142	209	19:00:11:39	TRACK 223	NO SPOT
0523	143	209	19:00:11:42	TRACK 224	X(P): 439 Y(P): 211 XC: 200 YC: 255
0524	144	209	19:00:11:46	TRACK 225	NO SPOT
0525	145	209	19:00:11:49	TRACK 226	X(P): 436 Y(P): 211 XC: 200 YC: 255
0526	146	209	19:00:11:52	TRACK 227	NO SPOT
0527	147	209	19:00:11:56	TRACK 228	NO SPOT
0528	148	209	19:00:11:59	TRACK 229	NO SPOT
0529	149	209	19:00:11:62	TRACK 230	NO SPOT
0530	150	209	19:00:11:66	TRACK 231	NO SPOT
0531	151	209	19:00:11:69	TRACK 232	X(P): 436 Y(P): 209 XC: 200 YC: 255
0532	152	209	19:00:11:72	TRACK 233	NO SPOT
0533	153	209	19:00:11:76	TRACK 234	X(P): 436 Y(P): 209 XC: 200 YC: 255
0534	154	209	19:00:11:79	TRACK 235	NO SPOT
0535	155	209	19:00:11:82	TRACK 236	X(P): 435 Y(P): 210 XC: 200 YC: 255
0536	156	209	19:00:11:86	TRACK 237	NO SPOT
0537	157	209	19:00:11:89	TRACK 238	NO SPOT
0538	158	209	19:00:11:92	TRACK 239	X(P): 438 Y(P): 208 XC: 200 YC: 255

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0539    159         209 19:00:11:96  TRACK 240  X(P): 437 Y(P): 209 XC: 200 YC: 255
0540    160         209 19:00:11:99  TRACK 241     NO SPOT
0541    161         209 19:00:12:02  TRACK 242  X(P): 436 Y(P): 210 XC: 200 YC: 255
0542    162         209 19:00:12:06  TRACK 243     NO SPOT
0543    163         209 19:00:12:09  TRACK 244  X(P): 436 Y(P): 212 XC: 200 YC: 255
0544    164         209 19:00:12:12  TRACK 245     NO SPOT
0545    165         209 19:00:12:16  TRACK 246  X(P): 434 Y(P): 215 XC: 200 YC: 255
0546    166         209 19:00:12:19  TRACK 247     NO SPOT
0547    168         209 19:00:12:26  TRACK 249  X(P): 432 Y(P): 228 XC: 200 YC: 255
0548    144         209 19:00:12:29  TRACK 250  X(P): 437 Y(P): 209 XC: 203 YC: 255
0549    151         209 19:00:12:52  TRACK 257  X(P): 436 Y(P): 209 XC: 203 YC: 255
0550    152         209 19:00:12:55  TRACK 258  X(P): 436 Y(P): 208 XC: 203 YC: 255
0551    159         209 19:00:12:75  TRACK 264  X(P): 439 Y(P): 206 XC: 203 YC: 255
0552    159         209 19:00:12:79  TRACK 265  X(P): 439 Y(P): 206 XC: 203 YC: 255
0553    160         209 19:00:12:82  TRACK 266  X(P): 438 Y(P): 206 XC: 203 YC: 255
0554    163         209 19:00:12:92  TRACK 269  X(P): 439 Y(P): 207 XC: 203 YC: 255
0555    191         209 19:00:13:85  TRACK 297  X(P): 439 Y(P): 207 XC: 203 YC: 255
0556    192         209 19:00:13:89  TRACK 298  X(P): 437 Y(P): 208 XC: 203 YC: 255
```

B. TOW II ELECTROMAGNETIC PULSE (EMP) VIDEO IMAGE DATA ANALYSIS

During the course of performance on this purchase order, SAI was tasked to process video data recorded at the Line 6 electromagnetic test facility. The video data recorded was of several EMP signals impinging on a TOW II motor selected for EMP testing. Up to five tests points within the TOW II motor were instrumented for EMP measurement. These instrumented points were connected by fiber optic links to five transient digitizers housed within one of the mobile data acquisition vans used by the Laser and Optical Test Group for field test data acquisition. A sixth transient digitizer was connected to a field probe which captured the EMP pulse as it propagated through the atmosphere. SAI was tasked to produce plots of the Fast Fourier Transform and the Inverse Transform of the EMP pulses as they impacted the TOW II motor at the selected instrumented test points.

1. EMP Video Tape Processing

As the EMP pulses impacted on the TOW motor, the transient digitizers were triggered with a corresponding representation of the EMP pulse being displayed on the transient digitizer video monitors. These traces were also recorded on analog video tapes.

The analog video tapes were delivered to SAI at Building 4500 on Redstone Arsenal, Alabama. There the EMP trace data was manually processed using the VDI-200 Image Analysis System in conjunction with the co-located HP 1000 computer.

As a prelude to software processing, the video data was recorded manually on the Ampex MD 600 video disk by the operator. The Ampex video disk then supplied the video input to the VDI-200 Image System. The operator went through the boot up procedures for the VDI-200 which placed it in a state whereby it could be controlled by either commands entered through its own local system console terminal or by software program commands sent over from the Hewlett Packard 1000 computer which then controlled the VDI-200 remotely.

2. Manual VDI-200 EMP Pulse Definition

Using an SAI-developed software program, DTRAH, the operator interactively and in a manual mode defined the EMP Pulse as it was displayed on the VDI-200 video monitor. The DTRAH program allowed the operator to define and collect data points of each EMP trace as it was manifested when it was collected at the particular test points within the TOW motor on the test range. By using the VDI-200 system trackball, the operator manually positioned a visible cursor on the VDI-200 system to various points along the trace. When a particular key (these keys having been defined by the software with certain meanings) on the VDI-200 function keyboard was depressed by the operator, the data point was tranferred to the HP 1000 computer system. Each point of the trace was defined in the above manner. Thus at the end of a trace the operator had defined points along the EMP trace, and those points had been read by the HP 1000 CPU. As the points of a trace were sent to the HP 1000, they were saved in a data array. At the end of the trace definition the operation depressed a different key on the VDI-200 function keyboard signaling end of trace. At this point, the data defining the trace was written to an HP disk file.

Traces from the other instrumented points were likewise manually reduced and their representative data points recorded in an HP 1000 disk data file.

3. Processing the Manually Reduced EMP Pulse Data

Once the EMP pulses had been defined and their data points stored in an HP 1000 disk file, the user could proceed to manipulate these files to produce plots of the Fast Fourier Transform and the Inverse Transform of the EMP data.

In order to process the above data files, it was necessary that SAI modify software previously written to process automatically collected and reduced transient digitizer traces so that the software would now process the manually reduced data records. SAI modified the software to accept the manually processed data.

Figure 1 is an FFT plot of the data from the third transient digitizer in the set of six used to collect the EMP data. As shown on the plot it is the EMP data collected from test point C11 of the TOW motor. Figure 2 is the inverse transform of the EMP pulse collected from the same data point within the TOW motor.

4. FFT Source Software

The modified software used to process the manually reduced EMP data resides in an HP 1000 source disk data file labeled &FFTLL. In order to compile, load and run the program, a complementary transfer file was created and stored in a disk file labeled \FFTLL. Both of these files are currently located on the HP 1000 Image Analysis System on disk Logical Unit 12. The plot procedure can easily be invoked by the user entering the command ,:\FFTLL, at one of the HP 2648 graphics terminals.

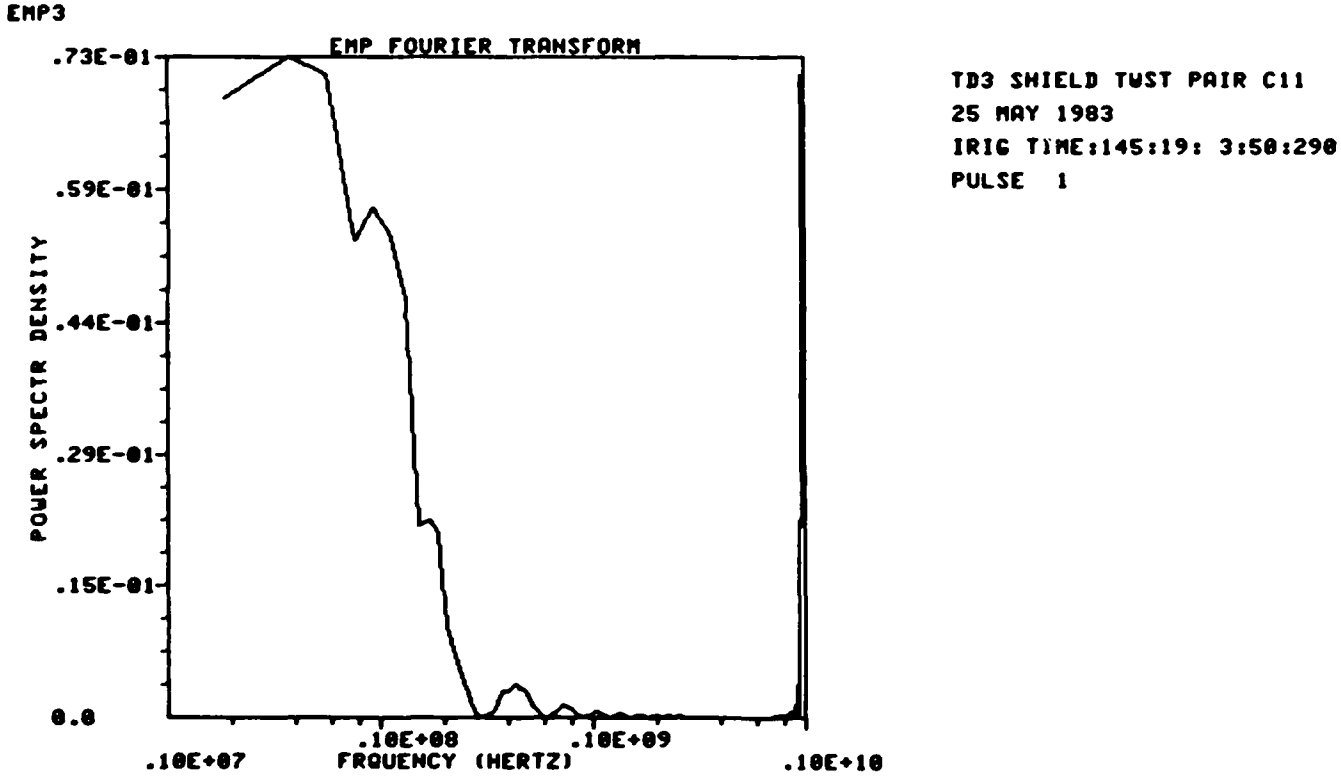

FIGURE 1. FFT Plot

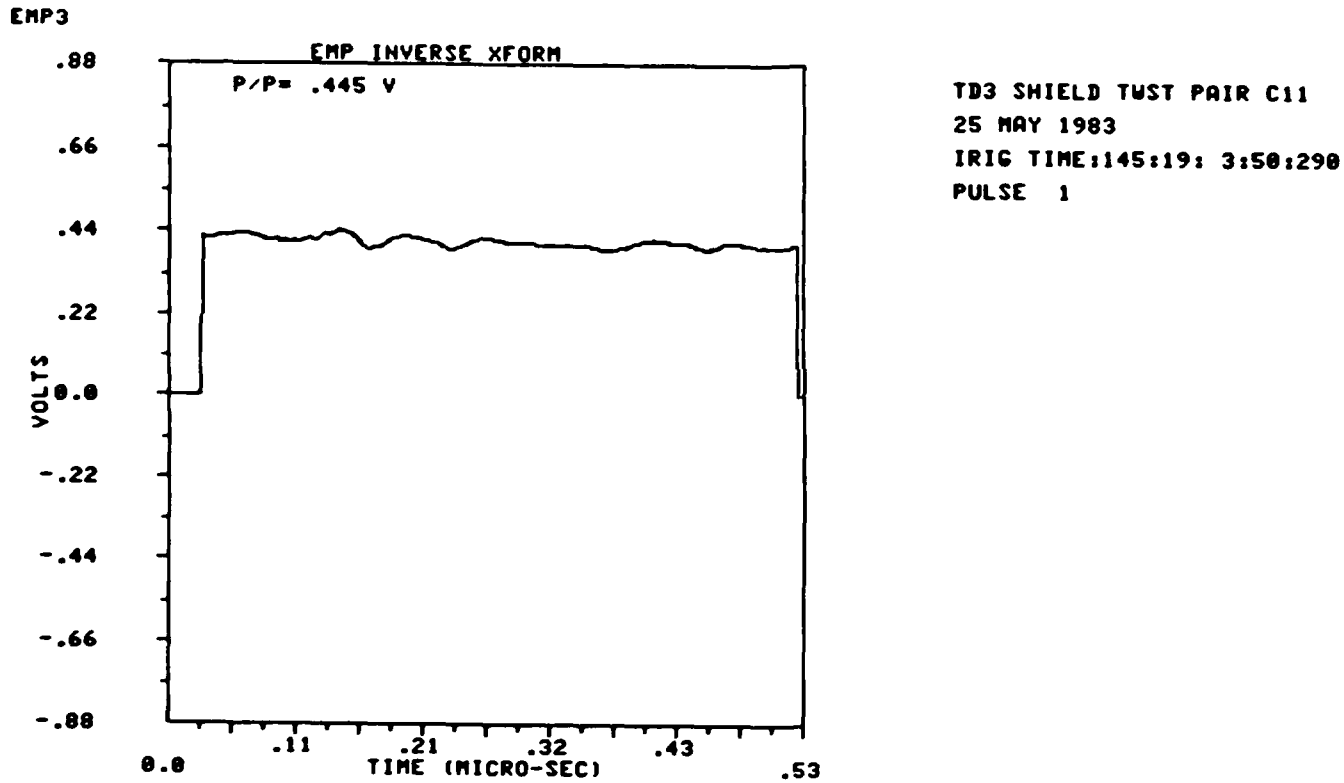

FIGURE 2. Inverse Transform of EMP Pulse

C. ALIMS SYSTEM MODIFICATION

The Automated Laser Instrumentation Measurement System's (ALIMS) laser baselining subsystem software was modified to incorporate the acquisition of temperature data while laser testing is in progress. For a particular laser being characterized, four temperature probes are now read from instrumented locations within the laser test laboratory. The temperature data collected enables the test engineer to analyze laser performance as a function of temperature. To simulate temperature conditions that might be encountered in actual field use, the laser being tested may be subjected to a wide range of temperature variations. Thus a temperature range in which the laser functions relative to its performance specifications can be established in a laboratory setting.

As noted above, four thermocouples were placed in the laser testing laboratory to capture the temperature readings. The following temperatures are now read by the ALIMS software:

(1) The ambient air room temperature of the laboratory in which the laser is undergoing testing.

(2) The Thermotron environmental chamber air temperature within which the laser is housed. Thus the temperature of the air mass surrounding the laser is known.

(3) The laser heat exchanger exhaust temperature. This is the temperature of the air being fan-forced from inside the operating laser. This gives the test engineer an indication of the actual internal operating temperature of the laser as the laser test progresses.

(4) The base plate temperature. The base plate mounting fixture is the foundation on which the laser sits as it is being tested.

The above temperature readings provide a means of measuring the environmental effects of temperature on laser performance.

While laser testing is in progress, the temperature data is read every laser pulse. To aid in evaluating the tested laser, the data is stored to computer disk files for future printout or plotting.

D. AGA Program

The fourth stipulation of this purchase order concerned the processing of HELLFIRE Missile Flight Data acquired at Eglin Air Force Base, Florida, during the time frame of this purchase order. Each frame of video, taken as the missile proceeds from the launcher to the target, is individually digitized using the Quantex DS 20 Image Analyzer. The objective of this activity is to sum up the pixel intensities of the missile plume, thereby permitting the computation of total radiant energy emitted by the missile as shown in each video frame.

The AGA Program, named for the type of camera used in data acquisition, was developed to reduce thermographic image data. The dialogue for the AGA program, given below, is included as an example of how the video digitization of the data gathered in Eglin was accomplished. Following log-on at the user terminal, the user enters RU,AGA and the following menu is displayed. Where inputs are shown, they are derived from the actual test data.

1. AGA DATA REDUCTION

0 - TERMINATE
1 - CREATE DATA FILE
2 - STORE GENERAL TEST INFORMATION IN DATA FILE
3 - STORE AGA CAMERA DATA IN DATA FILE
4 - CREATE CONTROL VOLTAGE CALIBRATION TABLE
5 - CREATE BLACKBODY CALIBRATION TABLE
6 - PROCESS VIDEO DATA TAPE

ENTER OPTION: X

The user may enter 0 to terminate the AGA program. The remaining options allow the user to store test information, create various tables, reuse certain data, and/or change existing data.

OPTION 1: The user enters 1 to create a data file, and the following questions appear to elicit user response:

2. CREATE DATA FILE
   ENTER DISC FILE NAME: AGAMS1

   The user enters the name (up to six characters) he wishes to assign to this file.

3. ENTER CARTRIDGE NUMBER FOR DISC FILE: 14

   The user enters the number of the cartridge on which he wishes the data stored.

4. ENTER SECURITY CODE: XX

   The user enters the security code for this file.

5. ENTER FILE SIZE (LENGTH OF TEST IN SEC): 2

   The user enters the length of the test in seconds.

6. ****FILE ALREADY EXISTS -- REUSE OR TERMINATE (R or T): R/T

   If the file already exists, the user may choose to reuse it by entering R, or he may choose to terminate it by entering T.

OPTIONS 2-6: Before Options 2-6 can be utilized, the user must open a file. This file will henceforth be referred to as file "B." The three questions below will follow the selection of options 2-6:

7. ENTER NAME OF FILE TO OPEN: AGAMS1
   ENTER CARTRIDGE NUMBER: 14
   ENTER SECURITY CODE: XX

   The user assigns a name to the file, selects the cartridge he wishes to

use, and enters the security code. This information is retained and will not be requested again if the user selects subsequent options.

OPTION 2: If the user selects option 2 - STORE GENERAL TEST INFORMATION IN DATA FILE, the following dialogue ensues:

8. GENERAL TEST INFORMATION

0 - RETURN TO MAIN MENU
1 - ENTER NEW INFORMATION
2 - EDIT EXISTING INFORMATION
3 - TRANSFER SELECT SUBSET OF INFORMATION FROM ANOTHER FILE
4 - TRANSFER ENTIRE SET OF INFORMATION FROM ANOTHER FILE

ENTER OPTION: X

The user may enter 0 to return to the main menu, or 1 through 4 to select the respective function. The selection of OPTION 1 initiates the following:

9. ENTER NEW GENERAL TEST INFORMATION

ENTER TEST DATE (MO:DA:YR): 09:25:83

The user enters the date of the test as shown.

10. ENTER TEST SITE (16 CHAR): EGLIN AFB

The user enters the test site (up to sixteen characters).

11. ENTER TEST PROGRAM (16 CHAR): HF MENS SM MOTOR

The user enters the name (up to sixteen characters) of the test program.

12. ENTER MISSION NUMBER (16 CHAR): MS-3

The user enters the mission number (up to sixteen characters).

When this information has been entered, the program displays the following table showing the values now in the record:

13. GENERAL TEST INFORMATION

ITEM 1 - TEST DATE	XX:XX:XX
ITEM 2 - TEST SITE	XXXXXXXX
ITEM 3 - TEST PROGRAM	XXXXXXXX
ITEM 4 - MISSION NUMBER	XX

The display remains on the screen for ten seconds, after which it returns to the submenu shown above in item 8.

The user may select OPTION 2 to edit existing information. This option prompts the following dialogue:

14. EDIT EXISTING GENERAL TEST INFORMATION

```
                                [XX:XX:XX]
ENTER TEST DATE (MO:DA:YR):  XX:XX:XX

                               [XXXXX]
ENTER TEST SITE (16 CHAR):  XXXXX

                                 [XXXXX]
ENTER TEST PROGRAM (16 CHAR):  XXXXX

                                   [XXXXX]
ENTER MISSION NUMBER (16 CHAR):  XXXXX
```

The program displays the information currently on the record in brackets above the user input. The user may enter new data, or if satisfied with the current data as shown, hit return to proceed. After all four items have been edited, the information is displayed again, as shown in item 13. After ten seconds the program returns to the submenu shown in item 8.

The selection of OPTION 3 of the submenu General Test Information allows the user to transfer a subset of information from one file ("A") to another ("B"):

15. TRANSFER A SELECT SUBSET OF GENERAL TEST INFORMATION FROM ANOTHER FILE

ENTER FILE NAME CONTAINING DESIRED INFORMATION: XXXXX
ENTER CARTRIDGE NUMBER: XX
ENTER SECURITY CODE: XX

The user must open the file from which he wishes to transfer information (file A). The above questions will appear, and the user inputs the file name, cartridge number and security code of that file.

16. ITEM 1 - TEST DATA
ITEM 2 - TEST SITE
ITEM 3 - TEST PROGRAM
ITEM 4 - MISSION NUMBER

ENTER ITEM NUMBERS: X,X,X

The table of items in file A is displayed. The user enters, in numerical order, the number of the item(s) he wishes to transfer. The program automatically transfers those items from file A to file B and then displays the table again as it now appears in file B:

17.

ITEM 1 - TEST DATA	XXXXXX
ITEM 2 - TEST SITE	XXXX
ITEM 3 - TEST PROGRAM	XXXXXX
ITEM 4 - MISSIONS NUMBER	XXXX

After ten seconds the program returns to the submenu shown in item 8.

Selecting OPTION 4 of the submenu will transfer an entire set of general test information from another file.

18. TRANSFER ENTIRE SET OF GENERAL TEST INFORMATION FROM ANOTHER FILE

ENTER FILE NAME CONTAINING DESIRED INFORMATION: XXXXX
ENTER CARTRIDGE NUMBER: XX
ENTER SECURITY CODE: XX

The user must open the file from which he wishes to transfer information (file "A") by answering the above questions.

19. ITEM 1 - TEST DATA XXXXXX
ITEM 2 - TEST SITE XXXXXX
ITEM 3 - TEST PROGRAM XXXXXX
ITEM 4 - MISSION NUMBER XX

At this point the entire set of general test information has been transferred. The table as it now appears in file "B" is displayed for ten seconds. The program then returns to the submenu shown in item 8.

OPTION 3: The third option of the AGA Data Reduction Program allows AGA camera data to be stored in a data file. The selection of option 3 - STORE AGA CAMERA DATA IN DATA FILE initiates the following program-to-user dialogue:

20. AGA CAMERA DATA

0 - RETURN TO MAIN MENU
1 - ENTER NEW INFORMATION
2 - EDIT EXISTING INFORMATION
3 - TRANSFER SELECT SUBSET OF INFORMATION FROM ANOTHER FILE
4 - TRANSFER ENTIRE SET OF INFORMATION FROM ANOTHER FILE

ENTER OPTION: X

The user may enter 0 to return to the main menu. The user may select OPTION 1 to enter new information into an existing file:

21. ENTER NEW AGA CAMERA DATA

ENTER CAMERA HEAD S/N (16 CHAR): XXXXXX
ENTER CAMERA CU S/N (16 CHAR): XXXXXX
ENTER LENS TYPE (FOV) [16 CHAR]: XXXXXX
ENTER CALIBRATION APERTURE SETTING (16 CHAR): XXXXXX
ENTER TEST APERTURE SETTING (16 CHAR): XXXXXX
ENTER CU CAL SENSITIVITY SETTING (16 CHAR): XXXXXX
ENTER CU TEST SENSITIVITY SETTING (16 CHAR): XXXXXX
ENTER SCAN CONVERTER MODEL (16 CHAR): XXXXXX
ENTER BLACKBODY SOURCE MODEL (16 CHAR): XXXXXX
ENTER CAMERA POS WRT LAUNCHER/TGT LINE (X,Y,Z) [16 CHAR]: X,X,X

The user enters the new information requested. Note that each response is limited to sixteen characters.

22. AGA CAMERA DATA

ITEM 1 - CAMERA HEAD S/N XXXXXX
ITEM 2 - CAMERA CU S/N XXXXXX
ITEM 3 - LENS TYPE (FOV) XXXXXX
ITEM 4 - CALIBRATION APERTURE SETTING XXXXXX
ITEM 5 - TEST APERTURE SETTING XXXXXX
ITEM 6 - CU CAL SENSITIVITY SETTING XXXXXX
ITEM 7 - CU TEST SENSITIVITY SETTING XXXXXX
ITEM 8 - SCAN CONVERTER MODEL XXXXXX
ITEM 9 - BLACKBODY SOURCE MODEL XXXXXX
ITEM 10 - CAMERA POSITION WRT LAUNCHER/
TGT LINE (X,Y,Z) XXXXXX

The program displays the information as it now exists in the data file. After ten seconds, it returns to the submenu shown in item 20 above.

OPTION 2 - Edit Existing Information allows the user to change or delete any of the ten items in the file. Its selection initiates the following dialogue:

23. EDIT EXISTING AGA CAMERA DATA

```
                                        [XXXXXX]
ENTER CAMERA HEAD S/N (16 CHAR):  XXXXXX

                                        [XXXXXX]
ENTER CAMERA CU S/N (16 CHAR):    XXXXXX

                                        [XXXXXX]
ENTER LENS TYPE (FOV) [16 CHAR]:  XXXXXX

                                                  [XXXXXX]
ENTER CALIBRATION APERTURE SETTING (16 CHAR):  XXXXXX

                                              [XXXXXX]
ENTER TEST APERTURE SETTING (16 CHAR):  XXXXXX

                                                 [XXXXXX]
ENTER CU CAL SENSITIVITY SETTING (16 CHAR):  XXXXXX

                                                  [XXXXXX]
ENTER CU TEST SENSITIVITY SETTING (16 CHAR):  XXXXXX

                                            [XXXXXX]
ENTER SCAN CONVERTER MODEL (16 CHAR):  XXXXXX

                                             [XXXXXX]
ENTER BLACKBODY SOURCE MODEL (16 CHAR):  XXXXXX

                                                                [XXXXXX]
ENTER CAMERA POS WRT LAUNCHER/TGT LINE (X,Y,Z) [16 CHAR]:  X,X,X
```

One by one, the above questions will appear providing the user the opportunity to edit. The existing data for each question appears in brackets above it. If the user desires no changes to the item dis-

played, he hits return to proceed. When all questions have been considered, the program displays the file again as in item 22 above. After ten seconds it returns to the submenu.

OPTION 3 of the AGA Camera Data submenu allows the user to transfer a select subset of data from one file (A) to another (B):

24. TRANSFER A SELECT SUBSET OF AGA CAMERA DATA FROM ANOTHER FILE

ENTER FILE NAME CONTAINING DESIRED INFORMATION: XXXXXX
ENTER CARTRIDGE NUMBER: XX
ENTER SECURITY CODE: XX

The user must open the file from which he wishes to transfer information (file A). The above questions will appear and are necessary to locate that file. The AGA camera data file will be displayed to the user (see item 22) so that he may select the item number(s) he wishes transferred.

25. ENTER ITEM NUMBERS: X,X,X

The user lists in sequence the numbers of the items he wishes transferred. At this point the program accomplishes the transferral and displays the file (B) as it now exists. After ten seconds it returns to the submenu.

OPTION 4 of this submenu allows the user to transfer an entire set of AGA Camera Data from another file:

26. TRANSFER ENTIRE SET OF INFORMATION FROM ANOTHER FILE

ENTER FILE NAME CONTAINING DESIRED INFORMATION: XXXXXX
ENTER CARTRIDGE NUMBER: XX
ENTER SECURITY CODE: XX

The user must open the file from which he wishes to transfer information

(file "A") by answering the above prompts.

The program accomplishes the transferral, and displays the information as it now exists in file B (see item 22). After ten seconds the program returns to the submenu.

OPTION 4: Option 4 of the AGA Data Reduction Program is used to create a control voltage calibration table. The following submenu appears to offer four options:

27. CREATE CONTROL VOLTAGE CALIBRATION TABLE

    0 - RETURN TO MAIN MENU
    1 - CREATE NEW TABLE
    2 - TRANSFER TABLE FROM ANOTHER FILE
    3 - MANUALLY ENTER TABLE VALUES IN FILE

    ENTER OPTION: X

The user may enter 0 to return to the main menu. OPTION 1 may be selected to create a new table:

28. CREATE NEW CONTROL VOLTAGE CALIBRATION TABLE

    ENTER VOLTAGE (XX) [NEG VAL = NO MORE VOLTAGES]: XXX

The user enters the first voltage. Entering a negative value will indicate to the program that there are no more voltages, and the program will advance to item 31 below.

29. ENTER TRACK # FROM FRAME XXX FOR XXXX VOLTS: XXX

The user enters the track number for the frame and voltage given. (There may be as many as ten frames per volt to average.) The program digitizes this frame, and requests the next:

30. ANY MORE FRAMES FOR THIS VOLTAGE? (Y/N) [DEF=N]: Y/N

If the user desires to digitize another frame for this voltage, he enters Y, and the program repeats from item 29 above. If he enters N (the default), the program repeats from item 28 above.

When no more voltages are desired, the program writes the data to the file.

31. CONTROL VOLTAGE CALIBRATION TABLE

INTENSITY	VOLTAGE
11	.100
51	.200
87	.300

The above table is then displayed, showing the values just entered. After ten seconds the program returns to the submenu of item 27.

The selection of OPTION 2 from the submenu allows for the transfer of a control voltage calibration table from another file:

32. TRANSFER CONTROL VOLTAGE CALIBRATION TABLE FROM ANOTHER FILE

ENTER NAME OF FILE TO OPEN: XXXXXX
ENTER CARTRIDGE NUMBER: XX
ENTER SECURITY CODE: XX

The user enters the name, cartridge number and security code for the file from which he wishes to transfer the data. The program automatically accomplishes the transferral and displays the table (as shown in item 31 above) of the values in this record. After ten seconds, it returns to the Control Voltage Calibration Table submenu.

OPTION 3 of this submenu allows the user to manually enter Control Voltage Calibration Table values into a file:

33. MANUALLY ENTER CONTROL VOLTAGE CALIBRATION TABLE VALUES IN FILE
[CR = NO MORE VOLTAGES]

ENTER INTENSITY (XX): XX
ENTER VOLTAGE (XX): XX

The user enters the intensity and voltage values. (For the user's convenience, the program will keep up with the numerical sequence of each and include it in parentheses with the question.) These questions will repeat until the user hits the carriage return (CR) to indicate that there are no more voltages and intensities. The information is then written to the file, and the newly created table is displayed (see item 31 above) for ten seconds before returning to the submenu.

OPTION 5: Option 5 of the AGA Data Reduction Program is used to create a blackbody calibration table. It contains four options:

34. CREATE BLACKBODY CALIBRATION TABLE

0 - RETURN TO MAIN MENU
1 - CREATE NEW TABLE
2 - TRANSFER TABLE FROM ANOTHER FILE
3 - MANUALLY ENTER TABLE VALUES IN FILE

ENTER OPTION: X

The user may enter 0 to return to the main menu, or he may enter 1 to create a new table. The latter will initiate the following dialogue:

35. CREATE NEW BLACKBODY CALIBRATION TABLE

ENTER TRACK # FOR FRAME TO DETERMINE WINDOWS: XXX

The user enters the track number for the frame to be used.

In order to obtain the mean intensity above background, the user must first setup four windows from which the average intensity of the background will be established. This value is then subtracted from the intensity of the spot.

36. ENTER UPPER LEFT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX
ENTER UPPER RIGHT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX
ENTER LOWER LEFT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX
ENTER LOWER RIGHT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX
ENTER WINDOW LIMITS FOR SPOT (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX

The user enters, in the order listed, the four points (in pixels from 1 to 512) to delineate that particular window, where SLIN = Start Line, ELIN = End Line, SCOL = Start Column, and ECOL = End Column.

37. ARE THESE WINDOWS SATISFACTORY? (Y/N) [DEF = Y]: Y/N

The windows as designated above are displayed on the Quantex monitor. If the windows selected are not satisfactory, the user enters N, and the prompts from item 35 above will be repeated. If he enters Y, the program advances.

38. ENTER # OF GREY LEVELS ABOVE BACKGROUND (DEF = 30): XX

The user enters the number of grey levels [from 1 (black) to 255 (white)] above the background which he wishes to be considered part of the spot. This minimizes the number of picture elements to be processed.

39. ENTER TEMP (XX) [NEG VAL = NO MORE TEMPS]: XXXX

The user enters the first blackbody temperature. Entering a negative value will indicate to the program that there are no more temperatures, and the program will advance to item 42 below.

40. ENTER TRACK # FOR FRAME XXX FOR XXX TEMP: XXX

The user enters the track # for the frame and temperature displayed. This frame is digitized, and the program requests the next one:

41. ANY MORE FRAMES FOR THIS TEMPERATURE? (Y/N) [DEF=N]: Y/N

If the user wishes to digitize another frame for this temperature, he enters Y, and the program repeats from item 40 above. If he enters N (the default), the program repeats from item 39 above. This process will continue until the user enters a negative value. At that point the program writes the data to file and displays the newly created table:

42. NEW BLACKBODY CALIBRATION TABLE

INTENSITY	TEMP
X	XXX
X	XXX
X	XXX

The calibration table is displayed for ten seconds, after which the program returns to the submenu.

OPTION 2 of the Blackbody Calibration Table submenu allows for the transferral of one Blackbody Calibration Table to another:

43. ENTER FILE NAME CONTAINING DESIRED INFORMATION: XXXXXX
ENTER CARTRIDGE NUMBER: XX
ENTER SECURITY CODE: XX

The user enters the file name, cartridge number and security code of the file containing the data he wishes transferred. The program writes the information into the other file and displays it to the user when complete:

44. BLACKBODY CALIBRATION TABLE

INTENSITY	TEMPERATURE
XX	X.XXX
XX	X.XXX
XX	X.XXX

After ten seconds the program returns to the submenu.

OPTION 3 of this submenu allows the user to manually enter Blackbody Calibration Table values into a file:

45. MANUALLY ENTER BLACKBODY CALIBRATION TABLE VALUES IN FILE
[CR = NO MORE TEMPERATURES]

ENTER INTENSITY (XX): XXX
ENTER TEMPERATURE (XX): XXXX

The user enters the intensity and temperature values. (The numerical sequence of each will appear in parentheses with the question for the user's convenience.) These questions will repeat until the user hits the carriage return (CR) to indicate that there are no more temperatures and intensities. The information is then written to the file, and the newly created table is displayed (see item 44 above) for ten seconds before returning to the submenu.

OPTION 6: Option 6 of the AGA Data Reduction Program is used to process video data tape.

46. PROCESS VIDEO DATA TAPE

ENTER TRACK # FOR FRAME TO DETERMINE WINDOWS: XXX

The user enters the track number for the frame to be used.

In order to obtain the mean intensity above background, the user must first setup four windows from which the average intensity of the background will be established. This value is then subtracted from the intensity of the spot.

47. ENTER UPPER LEFT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX
ENTER UPPER RIGHT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX
ENTER LOWER LEFT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX
ENTER LOWER RIGHT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX
ENTER WINDOW LIMITS FOR SPOT (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX

The user enters, in the order listed, the four points (in pixels from 1 to 512) to delineate that particular window, where SLIN = Start Line, ELIN = End Line, SCOL = Start Column and ECOL = End Column.

48. ARE THESE WINDOWS SATISFACTORY? (Y/N) [DEF = Y]: Y/N

The windows as designated above are displayed on the Quantex monitor. If the windows selected are not satisfactory, the user enters N and the prompts from item 47 above will be repeated. If he enters Y, the program advances.

49. ENTER # OF GREY LEVELS ABOVE BACKGROUND (DEF = 30): XX

The user enters the number of grey levels [from 0 (black) to 255 (white)] above the background which he wishes to be considered part of the spot. This minimizes the number of picture elements to be processed.

50. ENTER # OF PIXELS TO AVG FOR PEAK INTENSITY (DEF = 5): XX

Of the pixels meeting the intensity level requirement explained in item 49 above, the user selects a number of them to be averaged together for one average peak intensity. The default is 5.

51. ENTER # OF FRAMES/SEC TO PROCESS (1-30) [DEF = 30]: XX

The user enters the # of frames/second he wishes processed. There is a maximum of 30 frames per second. The default is 30, or every frame.

52. ENTER TEST START TIME (HR:MN:SC:MSC): XX:XX:XX:XXX
ENTER TEST STOP TIME (HR:MN:SC:MSC): XX:XX:XX:XXX

The user enters the start and stop times for the entire test in the order shown. (Note: Milliseconds must appear as a three-digit number.)

53. ENTER START FRAME FOR THIS SEGMENT: XXX

The user enters the number of the frame on which this test start time appears.

The program processes the data until the end of the test or the end of the segment, whichever comes first. (It will repeat this item, 52, until the end of the test.)

54. AGAMS1 T=0003 IS ON CR00014 USING 0064 BLKS R=0000

0001	0000 0.000	11	.100	51	.200	87	.300		
0002	IRIG TIME	BG	AVG	PK	#	TGT	TGT	APPRNT	
0003		PIX	TGT	TGT	PIX	CEN-	VOLTS	TGT	
0004		INT	INT	INT	DIFF	TROID		TEMP	
0005									
0006	17:40:12: 30	11	41	63	643	483	389	.233	0.00
0007	17:40:13: 96	12	38	66	600	454	388	.242	0.00
0008	17:40:13:162	9	35	66	544	422	384	.242	0.00
0009	17:40:13:228	9	38	68	338	392	388	.247	0.00
0010	17:40:13:294	10	39	64	187	360	396	.236	0.00
0011	17:40:13:360	8	38	66	167	344	398	.242	0.00

The output of this processing is given as illustrated in the above portion of the results of the Hellfire Missile Flight data reduction. The frame numbers appear in the first column, followed by the IRIG time. The average Background Pixel Intensity is given next, followed by both the average and peak intensities of the spot. The column headed "# Pixel Difference" refers to the number of pixels in the spot. "Target Centroid" is the X and Y coordinates of the center of the spot using line and column location. The "Target Volts" values are obtained by interpolating peak intensity using the Control Voltage Table and finding the corresponding voltage for that peak intensity. The "Apparent Target Temperature" values are obtained by interpolating peak intensity using the Blackbody Calibration Table and finding the corresponding temperature for that peak intensity. This column shows 0.00 because the temperature data was unavailable for processing.

E. SYSTEM MAINTENANCE ACTIVITIES

System maintenance activities included incorporating the 2326 system updates received from Hewlett Packard. New operating systems were generated and installed on both the ALIMS and Image Analysis HP 1000 computer systems.

A new operating system firmware kit for the RTE-6 V/M operating system was received for both the ALIMS and Image Analysis HP 1000 computer systems. The kits contained Base Set Prom 3, part number 92084-80103. The old Base Set Prom, part number 92084-80003, was removed from the FEM board on both computers and replaced with the new Base Set Prom.

Discussions were held with the HP CSS customer support representative centering primarily on the time-out problems that have been occurring with the DS/1000-IV in CPU to CPU communications. His approach to the problem was to use DSMOD, a DS/1000-IV program, to set the time-out limits to the maximum. This solution prevents the time-out error message from appearing on the system console and increases the length of time for a time-out to occur, but not significantly. It does not eliminate the problem. His opinion is that DS is meant to be an interactive communication with short time periods from one communication to the next. His suggestion that we run DSMOD in the WELCOM file and up the time-out limits is a good one and will be implemented.

Two hardware items were integrated into the Image Analysis System during the time frame of this purchase order. They were the Honeywell Video Image VGR 4000 hardcopy unit and the Harris 630 Frame Synchronizer.

END

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